

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
16 May 2002 (16.05.2002)

PCT

(10) International Publication Number
WO 02/038697 A3

(51) International Patent Classification⁷: **C09K 7/02**

(21) International Application Number: **PCT/US01/47311**

(22) International Filing Date:
13 November 2001 (13.11.2001)

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:
09/709,962 10 November 2000 (10.11.2000) **US**

(71) Applicant: **M-I L.L.C.** [US/US]; 1207 Louisiana Street,
Houston, TX 77002 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

(88) Date of publication of the international search report:
27 March 2003

(72) Inventors: **PATEL, Arvind, D.**; 11038 Watson Mill Court, Sugar Land, TX 77478 (US). **STAMATAKIS, Emanuel**; 13911 Darby Cove, Houston, TX 77077 (US). **DAVIS, Eric**; 7522 San Lucas Dr., Houston, TX 77083 (US).

(74) Agent: **WHITE, Carter, J.**; Howrey Simon Arnold and White, LLP, 750 Bering Drive, Houston, TX 77057-2198 (US).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



WO 02/038697 A3

(54) Title: **SHALE HYDRATION INHIBITION AGENT AND METHOD OF USE**

(57) Abstract: A water-base drilling fluid for use in drilling wells through a formation containing a shale which swells in the presence of water. The drilling fluid preferably includes: an aqueous based continuous phase, a weight material, and a shale hydration inhibition agent having the formula: $H_2N - R - \{OR'\}_x - Y$, in which R and R' are alkylene groups having 1 to 6 carbon atoms and x is a value from about 1 to about 25. The Y group should be an amine or alkoxy group, preferably a primary amine or a methoxy group. The shale hydration inhibition agent should be present in sufficient concentration to reduce the swelling of the shale. Also inclusive of the present invention is a method of reducing the swelling of shale clay encountered during the drilling of a subterranean well, the method comprising circulating in the well a water-base fluid formulated in accordance with the present invention.

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 01/47311

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C09K7/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C09K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	WO 01 59028 B1 (M-I L.L.C.) 16 August 2001 (2001-08-16) page 4, line 19 -page 6, line 8	1-8, 10-16
A	claims 1-19	9,17,18
Y	EP 0 838 514 A (MI DRILLING FLUIDS LLC) 29 April 1998 (1998-04-29) page 5, line 11 - line 22 page 6, line 55 -page 8, line 19 page 9, line 10 - line 58	1,4-6, 8-11,13, 14,16,17
Y	EP 0 634 468 A (MI DRILLING FLUIDS CO) 18 January 1995 (1995-01-18) page 5, line 37 -page 8, line 17 page 9, line 5 - line 42	1,4-6, 8-11,13, 14,16,17
	--- -/--	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

18 July 2002

Date of mailing of the international search report

26/07/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Boulon, A

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/47311

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 93 02151 A (LUBRIZOL CORP) 4 February 1993 (1993-02-04) page 9, line 9 - line 34 page 27, line 1 -page 28, line 11	1,2, 8-10,13
Y	US 5 330 662 A (JAHNKE RICHARD W ET AL) 19 July 1994 (1994-07-19) column 9, line 21 - line 46 column 19, line 31 -column 22, line 7	1,2, 8-10,13

INTERNATIONAL SEARCH REPORT

Ir on on patent family members

International Application No

PCT/US 01/47311

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0159028	B1	16-08-2001	US 6247543 B1 19-06-2001 AU 3311301 A 20-08-2001 WO 0159028 A2 16-08-2001
EP 0838514	A	29-04-1998	US 5424284 A 13-06-1995 EP 0838514 A1 29-04-1998 AT 173290 T 15-11-1998 AU 675709 B2 13-02-1997 AU 6612194 A 12-01-1995 CA 2126938 A1 03-01-1995 DE 69414481 D1 17-12-1998 DE 69414481 T2 01-07-1999 EP 0634468 A1 18-01-1995 NO 942493 A 03-01-1995 US 5908814 A 01-06-1999
EP 0634468	A	18-01-1995	US 5424284 A 13-06-1995 AT 173290 T 15-11-1998 AU 675709 B2 13-02-1997 AU 6612194 A 12-01-1995 CA 2126938 A1 03-01-1995 DE 69414481 D1 17-12-1998 DE 69414481 T2 01-07-1999 EP 0634468 A1 18-01-1995 EP 0838514 A1 29-04-1998 NO 942493 A 03-01-1995 US 5908814 A 01-06-1999
WO 9302151	A	04-02-1993	AU 647309 B2 17-03-1994 AU 2324492 A 23-02-1993 BR 9205352 A 16-11-1993 CA 2088480 A1 19-01-1993 CN 1068842 A 10-02-1993 EP 0549770 A1 07-07-1993 MX 9204198 A1 01-07-1993 NO 930976 A 17-03-1993 PH 30262 A 20-02-1997 US 5260268 A 09-11-1993 WO 9302151 A1 04-02-1993 ZA 9205310 A 28-04-1993
US 5330662	A	19-07-1994	CA 2091420 A1 18-09-1993 CN 1076471 A 22-09-1993 EP 0561607 A2 22-09-1993 FI 931163 A 18-09-1993 NO 930950 A 20-09-1993 US 5620946 A 15-04-1997 ZA 9301864 A 05-10-1993